

Fareast International University



Experiments Report

B.Sc. in EEE

Subject: Electrical Circuit I Sessional (EEE 1112)

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Experiment No: 01

Experiment Name: Verification of Kirchhoff's Laws.

Objective:

To verify Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) for the given circuit.

Circuit elements or components:

- Regulated power supply
- Voltmeters
- Ammeters
- Resistors
- Breadboard
- Connecting Wires.

Statement:

KCL: The algebraic sum of the currents meeting at a node is equal to zero.

KVL: In any closed path / mesh, the algebraic sum of all the voltages is zero.

Precautions:

1. Voltage control knob should be kept at minimum position.
2. Current control knob of RPS should be kept at maximum position.

Kirchhoff's Current Law (KCL):

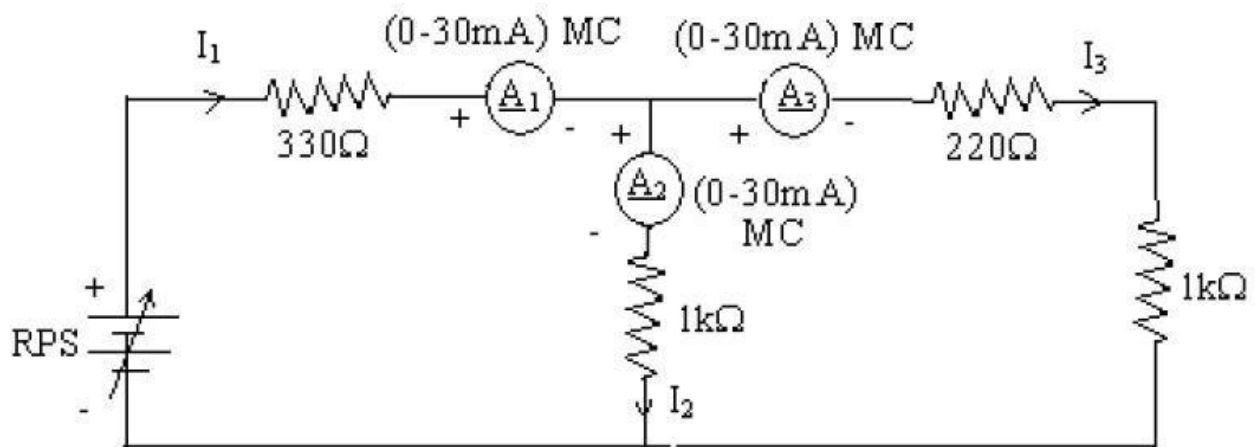


Figure 1: Circuit for KCL

Procedure for KCL:

1. Connect the circuit diagram as shown in figure 1
2. Switch ON the supply to RPS.
3. Apply the voltage and note the Ammeter readings.
4. Gradually increase the supply voltage in steps.
5. Note the readings of Ammeters.
6. Sum up the Ammeter readings (I_2 and I_3), that should be equal to total current (I_1).
7. Thus KCL is verified practically.

KCL - Theoretical Values:

Sl. No.	Voltage E Volts	Current			$I_1 = I_2 + I_3$ mA
		I_1 mA	I_2 mA	I_3 mA	
1	5	5.68	3.12	2.56	5.68
2	10	11.3	6.18	5.12	11.3
3	15	17.05	9.37	7.68	17.05
4	20	22.73	12.49	10.24	22.075
5	25	28.42	15.62	12.68	28.42

KCL - Practical Values:

Sl. No.	Voltage E Volts	Current			$I_1 = I_2 + I_3$ mA
		I_1 mA	I_2 mA	I_3 mA	
1	5	5.6	3.1	2.2	5.3
2	15	17.2	9.4	7.6	17
3	25	28	15.6	12.7	28.3

Kirchhoff's Voltage Law (KVL):

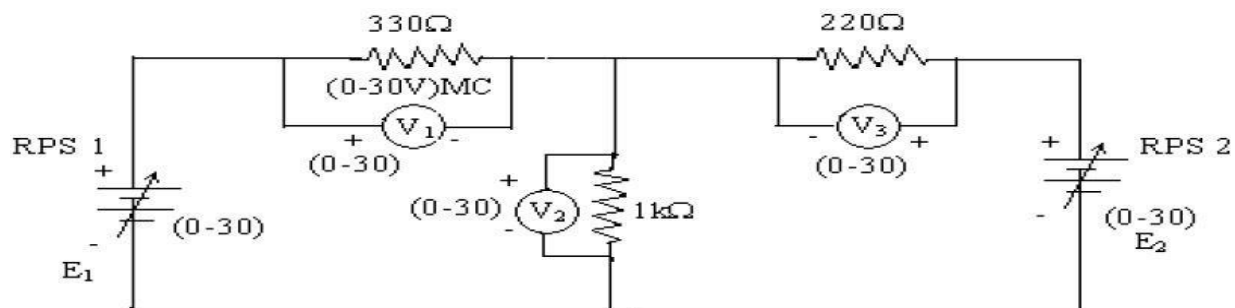


Figure 2: Circuit for KVL

Procedure for KVL:

1. Connect the circuit diagram as shown in figure 2.
2. Switch ON the supply to RPS.
3. Apply the voltage and note the voltmeter readings.
4. Gradually increase the supply voltage in steps.
5. Note the readings of voltmeters.
6. sum up the voltmeter readings (voltage drops), that should be equal to applied voltage.
7. Thus KVL is verified practically.

KVL – Theoretical Values:

Sl.No.	RPS		Voltage			KVL $E_1 = V_1 + V_2$ V
	E_1	E_2	V_1	V_2	V_3	
	V	V	V	V	V	
1	5	5	0.58	4.41	0.583	4.99
2	10	10	1.16	8.83	1.17	9.99
3	15	15	1.75	13.2	1.75	14.95
4	20	20	2.33	17.67	2.33	20
5	25	25	2.913	22.08	2.915	24.993

KVL - Practical Values:

Sl.No.	RPS		Voltage			KVL $E_1 = V_1 + V_2$ V
	E_1	E_2	V_1	V_2	V_3	
	V	V	V	V	V	
1	5	5	0.6	4.4	0.56	5
2	10	10	1.13	8.83	1.19	9.96
3	15	15	1.72	13.20	1.78	14.92

Result:

Thus Kirchhoff's voltage law and Kirchhoff's current law verified both theoretically and practically.

Experiment No: 02

Experiment Name: Verification of Superposition Theorem.

Objective: To verify the superposition theorem for the given circuit.

Circuit elements or components:

- Regulated power supply
- Voltmeters
- Ammeters
- Resistors
- Breadboard
- Connecting Wires.

Statement:

Superposition theorem states that in a linear bilateral network containing more than one source, the current flowing through the branch is the algebraic sum of the current flowing through that branch when sources are considered one at a time and replacing other sources by their respective internal resistances.

Precautions:

1. Voltage control knob should be kept at minimum position
2. Current control knob of RPS should be kept at maximum position

Procedure:

1. Give the connections as per the diagram.
2. Set a particular voltage value using RPS1 and RPS2 & note down the ammeter reading
3. Set the same voltage in circuit I using RPS1 alone and short circuit the terminals and note the ammeter reading.
4. Set the same voltage in RPS2 alone as in circuit I and note down the ammeter reading.
5. Verify superposition theorem.

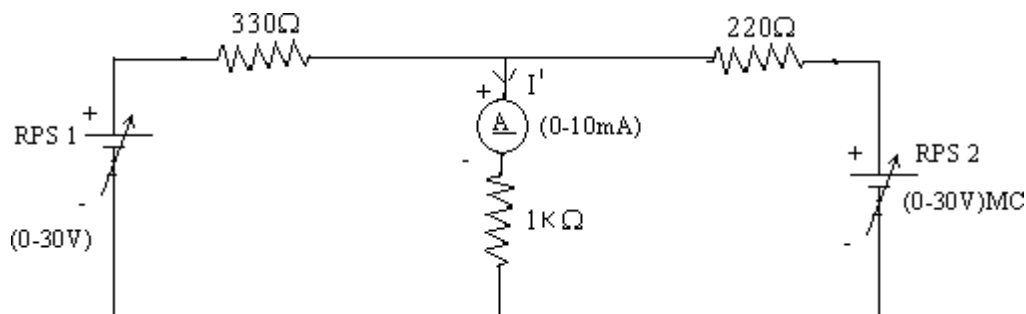


Figure: Circuit 1

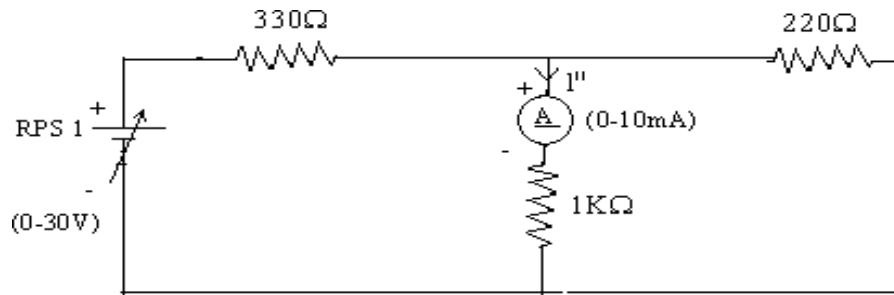


Figure: Circuit 2

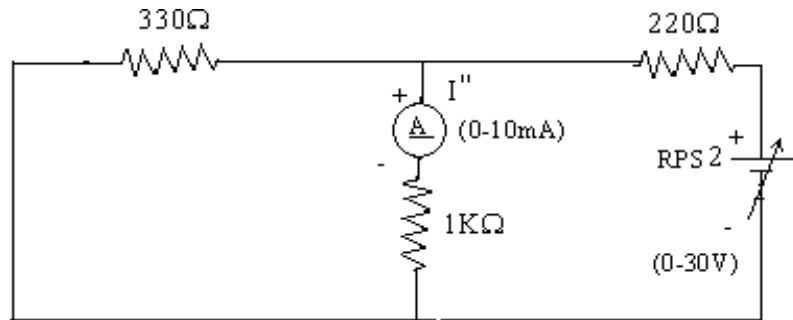


Figure: Circuit 2

Theoretical Values:

	RPS		Ammeter Reading (I) mA
	1	2	
Circuit – 1	10 V	10 V	$I = 8.83$
Circuit – 2	10 V	0 V	$I' = 3.5$
Circuit – 3	0 V	10 V	$I'' = 5.3$

$$I = I' + I'' = 8.83$$

Practical Values:

	RPS		Ammeter Reading (I) mA
	1	2	
Circuit – 1	10 V	10 V	$I = 8.5$
Circuit – 2	10 V	0 V	$I' = 3.5$
Circuit – 3	0 V	10 V	$I'' = 5$

$$I = I' + I'' = 8.5 \text{ mA} \\ = 3.5 + 5 = 8.5 \text{ mA}$$

Experiment No: 03

Experiment Name: Verification of Thevenin's theorem.

Objective: To verify Thevenin's theorem and to find the full load current for the given circuit.

Circuit elements or components:

- Regulated power supply
- Voltmeters
- Ammeters
- Resistors
- Breadboard
- Connecting Wires.

Statement:

Any linear bilateral, active two terminal network can be replaced by a equivalent voltage source (V_{TH}). Thevenin's voltage or V_{oc} in series with looking back resistance R_{TH} .

Precautions:

1. Voltage control knob of RPS should be kept at minimum position.
2. Current control knob of RPS should be kept at maximum position

Procedure:

1. Connections are given as per the circuit diagram.
2. Set a particular value of voltage using RPS and note down the corresponding ammeter readings.

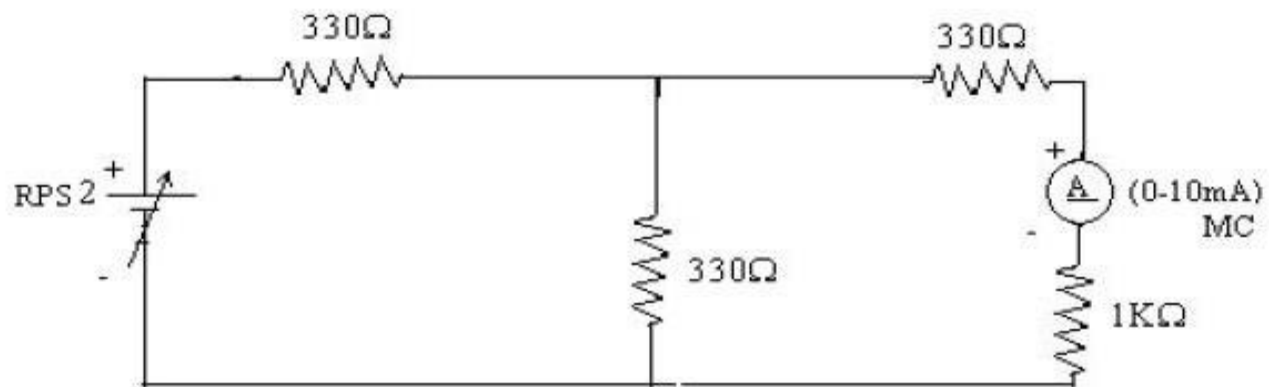
To find V_{TH}

3. Remove the load resistance and measure the open circuit voltage using multimeter (V_{TH}).

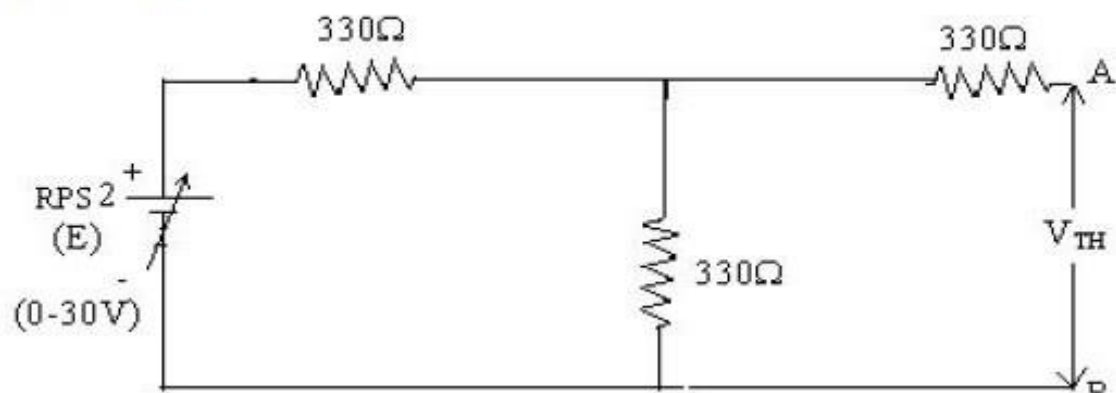
To find R_{TH}

4. To find the Thevenin's resistance, remove the RPS and short circuit it and find the R_{TH} using multimeter.
5. Give the connections for equivalent circuit and set V_{TH} and R_{TH} and note the corresponding ammeter reading.
6. Verify Thevenin's theorem.

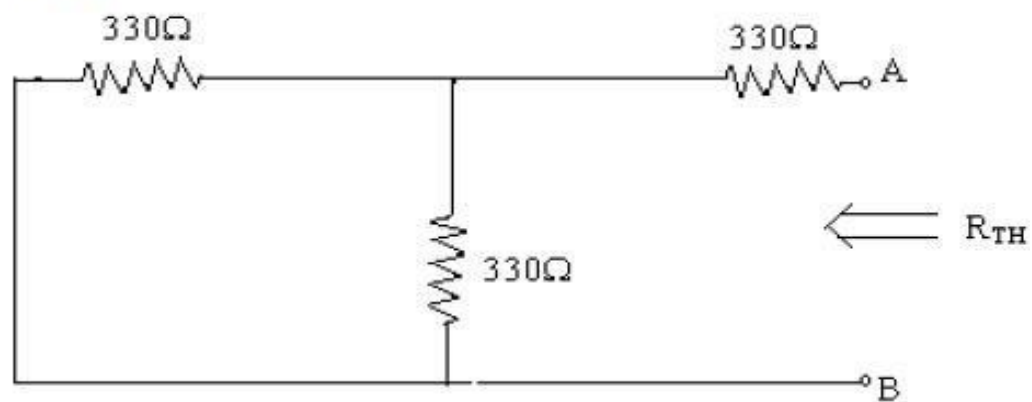
Circuit - 1 : To find load current



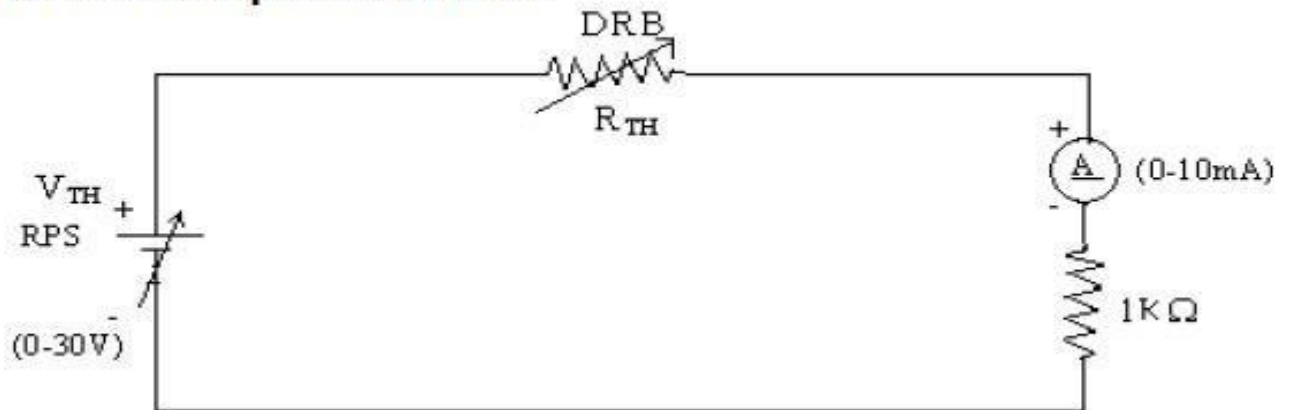
To find V_{TH}



To find R_{TH}



Thevenin's Equivalent circuit:



Theoretical and Practical Values:

	E(V)	$V_{TH}(V)$	$R_{TH}(\Omega)$	I_L (mA)	
				Circuit - I	Equivalent Circuit
Theoretical	10	5	495	3.34	3.34
Practical	10	4.99	484	3.3	3.36

Result:

Hence the Thevenin's theorem is verified both practically and theoretically